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IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Applicant:	Du	Docket No:	TI-29436
Serial No:	09/464,315	Examiner:	Makhdoom
Filed:	12/16/1999	Art Unit:	2123

For: METHOD AND CIRCUIT FOR OPERATING A VOICE COIL ACTUATOR OF A MASS DATA STORAGE DEVICE

APPEAL BRIEF PURSUANT TO 1.192(c)

CERTIFICATION OF FACSIMILE TRANSMISSION

I hereby certify that the following papers are being transmitted by facsimile to the U.S. Patent and Trademark Office at 571-273-8300 on 9-1-05.

Tammie Chambers

Assistant Commissioner for Patents
Washington, DC 20231

Dear Sir:

The following Appeal Brief is respectfully submitted in connection with the above identified application in response to the final rejection mailed January 26, 2005.

REAL PARTY IN INTEREST

The real party in interest is Texas Instruments Incorporated.

RELATED APPEALS AND INTERFERENCES

Appellants legal representative knows of no appeals or interferences which will be directly affected, or have a bearing on the Board's decision.

STATUS OF THE CLAIMS

Claims 1-27 were originally filed and Claims 6, 11, and 17 have been canceled. Consequently, the subject matter of the instant appeal is the final rejection of Claims 1-5, 7-10, and 12-16, and 18-27.

STATUS OF AMENDMENTS

The final Office Action mailed on April 1, 2005 amended no claims. No Advisory Action has been received and consequently Applicants do not know the status of the amendment after final.

SUMMARY OF THE CLAIMED SUBJECT MATTER

One of the reasons that the physical voice coil motor does not behave as predicted by prior art models is that the coil 20 of the VCM creates eddy currents in the adjacent magnets and other structures of the VCM assembly. The eddy currents do not self-extinguish as rapidly as the flyback current, and consequently result in the creation of a voltage across the coil when the excitation voltage has been removed. Thus, top and bottom current loops 68 and 70 are included in the model 50 to consider the eddy current effects.

The loop 68 includes a mutual inductor 72, having an inductance equal to the value of the VCM mutual inductor 58, an inductor 74, and a resistor 76, connected in series. The inductor 72 represents the mutual inductance between VCM coil and the top VCM magnetic plate. The magnet plate includes the top VCM magnet 28 and the surrounding structures, including the mounting plate 32 and top cover plate 35, into which eddy currents are induced. The inductor 74 represents the leakage inductance of the top VCM magnet plate, and the resistor 76 represents the resistance of the top VCM magnet plate.

Likewise, the bottom loop 70 includes a mutual inductor 78 having a value equal to the mutual inductance of the VCM inductor 58, and inductor 80 and a resistor 72, all connected in series. The inductor 78 represents the mutual inductance between VCM coil and the bottom VCM magnetic plate, which includes the bottom VCM magnet 26, and the surrounding structures, including the mounting plate 30 and base plate 34, into which eddy currents are induced. The inductor 80 represents the leakage inductance of the bottom VCM magnet plate, and the resistor 72 represents the resistance of the bottom VCM magnet plate. The first and second loops 68 and 70 are interconnected, as shown, at one side of the inductors 72 and 78.

First and second parasitic capacitors 86 and 88 are connected between the top and bottom ends of coil 58 and the interconnection nodes of inductors 72 and 74 and inductors 78 and 80, respectively. The values of capacitors 86 and 88 may be very small. Consequently, they may be ignored in many applications.

With the recognition that the effects of the induced eddy currents affects the accuracy of the measurement of the BEMF, according to the above described model, their effects can now be taken into account in measuring the BEMF. More particularly, in accordance with a preferred embodiment of the invention, prior to measuring the BEMF, a current may be injected into the coil 20 that is of magnitude and polarity such that the eddy currents existing in the structures surrounding the coil 20 may be substantially cancelled.

One circuit 90 by which eddy currents can be canceled or significantly reduced is shown in Figure 4. The circuit 90 includes a number of logic gates that are enabled by a float signal on line 92 that becomes high when the VCM predriver 42 (Figure 2) floats or tristates the driver transistors 44-47. The signals at the driver circuit nodes 62 and 58 are applied to differential amplifiers 96 and 98, respectively, which are referenced to ground or other reference potential 100 to produce outputs on respective output lines 102 and 104 when the input signals to the differential amplifiers 96 and 98 exceed the potential on the reference line 100.

The outputs from the amplifiers 96 and 98 are connected to one input of each respective AND gate 106 and 108, which are enabled by the float signal on line 92 that is applied to the other inputs thereof. The output signals on output lines 110 and 112, therefore, indicate the direction that the flyback current is flowing in the motor coil 20.

In addition, an exclusive OR (XOR) gate 114 receives the signals on lines 110 and 112 to produce an input to an AND gate 116, which also is enabled by the signal by the float signal 92. The output from the gate 116 on line 118, therefore, represents a logic state that exists only during the time that the flyback current in the motor coil 20 is above the reference voltage on line 100. The signal on line 118 thus represents an indication that the flyback is in existence, and issues a signal to enable AND gates 120 and 122 to which the output lines 110 and 112 from gates 106 and 108 are applied.

The output signals from gates 120 and 122 are applied on lines 121 and 123 to input terminals of a counter or timer 124, which also is enabled by the float signal on float line 92. The counter 124, below described in detail, is configured to determine a time that the flyback voltage exists above a predetermined magnitude, then to determine a time that either of the signals produced by AND gates 120 or 122 is high.

GROUNDS OF REJECTION

The sole issue under appeal is whether Claims 1, 2, 7, 12, 13, 18, 19, 23, and 24 are unpatentable under 35 U.S.C. § 102 as being anticipated by Pedrazzini.

ARGUMENTS

It is respectfully submitted that Pedrazzini does not disclose or suggest the presently claimed invention including a circuit to terminate the driving current and a circuit to create a magnetic field to oppose eddy currents established in structures adjacent to the coil by the driving current in independent Claim 1, a circuit to determine a BEM

voltage after termination of the driving current and a circuit to generate a magnetic field to oppose eddy current established in structures adjacent to the coil by the driving current in independent Claim 7, a circuit to determine the velocity of the head assembly after termination of the driving current and a circuit to create a magnetic field that opposes eddy current established in structures adjacent to the coil by the driving current in independent Claim 12, albeit defined as the method steps of terminating the driving current and applying a current the coil magnitude and direction to cancel eddy currents and structures adjacent to the coil in independent Claim 18 and as defined as determining when the driving current has been terminated and as activating selected VCM coil driver transistors to create a magnetic field to oppose eddy current established in structures adjacent to the coil by the driving currents in independent Claim 23.

The Examiner alleges that Pedrazzini inherently discloses to approve eddy current established in structures.

However, Pedrazzini discloses nothing with respect to generating a magnetic field to oppose eddy currents established in structures adjacent to the coil as recited above claimed subject matter. The Examiner should offer some proof that inherently exists.

CONCLUSION

For the foregoing reasons, Appellants respectfully submit that the Examiner's final rejection of Claims 1, 2, 7, 12, 13, 18, 19, 23, and 24 under 35 U.S.C. § 102 is not properly founded in law, and it is respectfully requested that the Board of Patent Appeals and Interferences so find and reverse the Examiner's rejections.

To the extent necessary, the Appellants petition for an Extension of Time under 37 CFR 1.136. Please charge any fees in connection with the filing of this paper, including extension of time fees, to the deposit account of Texas Instruments Incorporated, Account No. 20-0668.

Respectfully submitted,

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APPENDIX

Claim 1 (previously presented): A circuit to determine a velocity of a coil to which a driving current is applied in a magnetic field, comprising:

a circuit to terminate the driving current in said coil;

a circuit to apply a current to said same coil to create a magnetic field to oppose eddy currents established in structures adjacent said coil by said driving current; and

a circuit for measuring a BEMF in said coil after said current has been applied to oppose said eddy currents to determine said velocity.

Claim 2 (previously presented): The circuit of claim 1 wherein said driving current is in a first direction in said coil, and wherein said circuit to apply a current to said same coil applies a current in a direction opposite said first direction.

Claim 7 (previously presented): A circuit to determine a BEMF voltage of a VCM coil after termination of a driving current in a first current direction in said coil, comprising:

a circuit for activating selected VCM coil driver transistors to apply a current to said coil in a direction opposite said first current direction to generate a magnetic field to oppose eddy currents established in structures adjacent said coil by said driving current.

Claim 12 (previously presented): A circuit for use in determining a velocity of a head assembly of a VCM after termination of a driving current in a coil of said VCM, comprising:

a circuit for activating selected VCM coil driver transistors to apply a current to said same coil of said VCM to create a magnetic field that opposes eddy currents established in structures adjacent said coil by said driving current.

Claim 13 (original): The circuit of claim 12 wherein said driving current is in a first current direction and wherein said circuit for activating selected VCM coil driver transistors applies a current to said coil in a direction opposite said first current direction.

Claim 18 (previously presented): A method for determining a velocity of a coil to which a driving current is applied in a magnetic field, comprising:

terminating said driving current;

allowing a flyback current in said coil to reduce to below a predetermined magnitude;

applying a current to said same coil of magnitude and direction to cancel eddy currents in structures adjacent said coil; and

measuring a BEMF in said coil, wherein a magnitude of said BEMF is directly related to the velocity of said same coil.

Claim 19 (original): The method of claim 18 wherein said applying a current to said coil comprises applying a current to said coil a time directly related to a magnitude of the original current command.

Claim 23 (previously presented): A method for determining a BEMF voltage of a coil of a VCM after termination of a driving current in said coil, comprising:

determining when said driving current has been terminated; and

activating selected VCM coil driver transistors to apply a current to said same coil to create a magnetic field to oppose eddy currents established in structures adjacent said coil by said driving current.

Claim 24 (previously presented): The method of claim 23 wherein said driving current is in a first current direction, and wherein said activating selected VCM coil driver transistors comprises activating selected VCM coil driver transistors to create a current in said same coil in a direction opposite to said first current direction.

EVIDENCE APPENDIX

Appellants are submitting no items of evidence.

RELATED PROCEEDINGS APPENDIX

Appellants have no submission for the Related Proceeding Appendix.